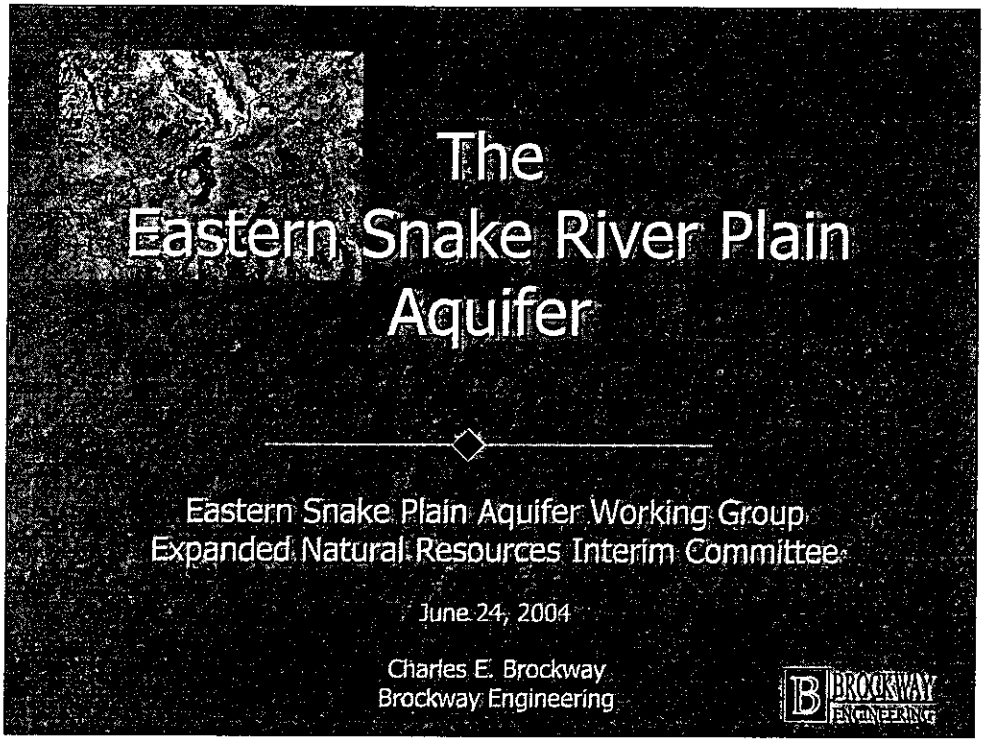

Salient Points

- The ESRPA is a single hydrologic unit
- Long term aquifer water balance is essential for maintenance of spring flows and water levels
- ESRP Aquifer is "out of balance"
- As evidenced by long term declines in:
  - Aquifer water levels
  - Spring flows
  - Snake River reach gains

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Salient Points

- Long term declines in spring flows and water levels are indicators of an over-appropriated aquifer
- Ground water pumping has resulted in over 2 million acre feet of consumptive depletions from the aquifer
- Only the stabilization and restoration of aquifer water balance can restore spring flows and river reach gains (springs)

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Salient Points

- Changes in groundwater depletions and artificial recharge can modify the water balance and restore springs flows and water levels in a reasonable time frame.

Goals

- Step 1: Stabilize the spring flows at 2004 levels within 5 years.
  - Thousand Springs and Blackfoot-Neeley reach
- Step 2: Restore aquifer water levels and spring flows to selected target levels that are hydrologically and economically feasible within a reasonable time
- Establish a monitoring program capable of documenting results on target spring flows

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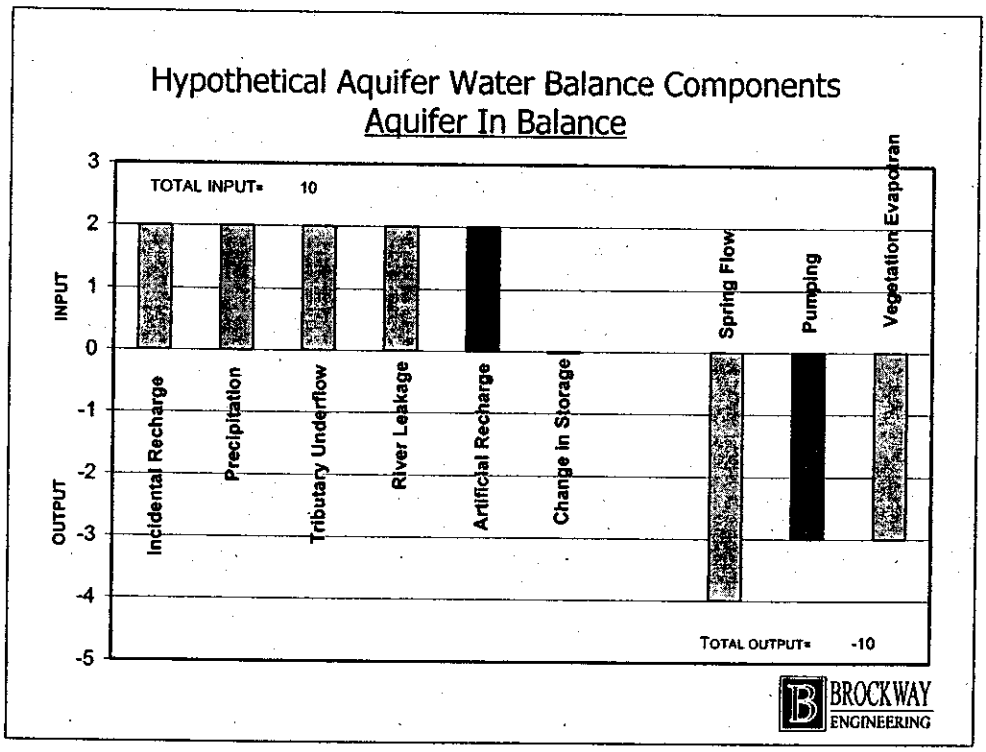


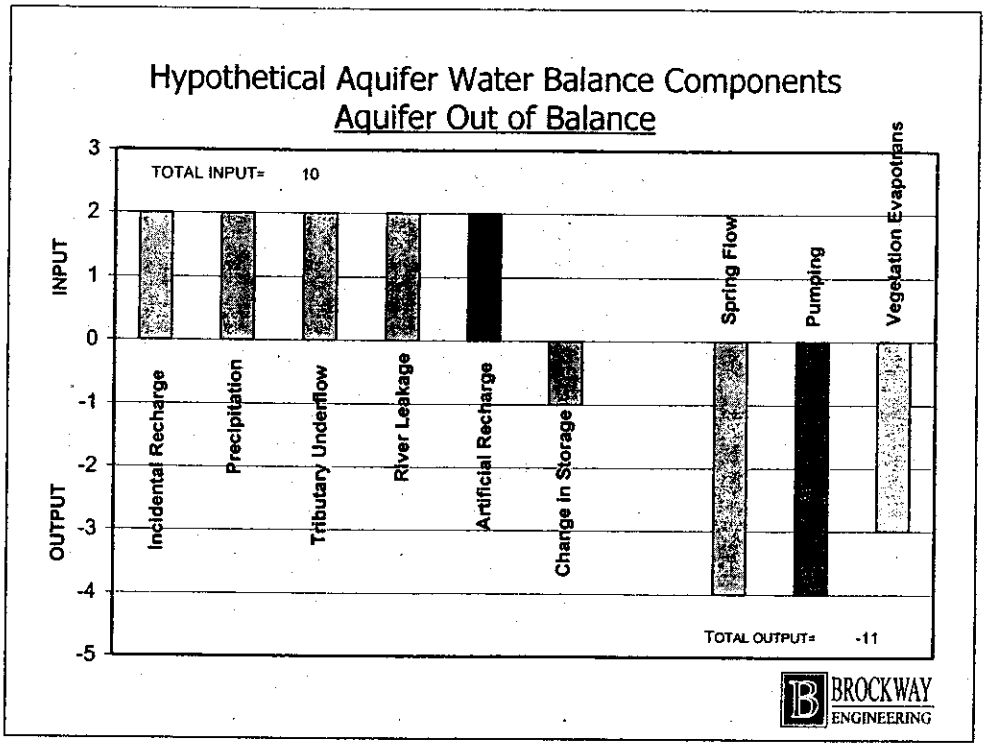
•Input and output components must be equal in order for the aquifer to be in balance

•Some aquifers may not have definable spring outflows, flows from which are determined by aquifer water levels near the springs

•Not all components of input and output are controllable

•Artificial recharge and pumping are controllable.

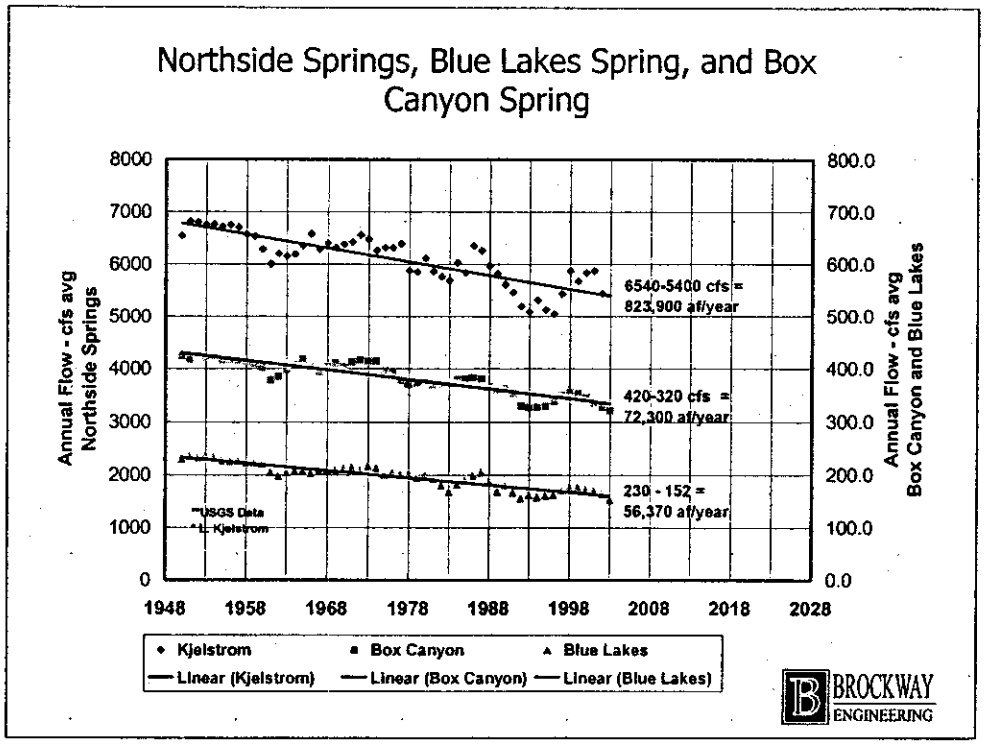
•No long term change in storage occurs in a balanced aquifer



•An aquifer which is out of balance will exhibit long term excess of output compared to input or vice-versa.

•If output exceeds input then the difference must come from a negative change in storage

•The ESRPA is out of balance



Northside springs increased from 1900's to 1960 (4200 to 6800 cfs)

Northside springs (Thousand Springs) have been decreasing since 1950's. Total spring discharge is estimated from Kjelstrom(USGS)

Estimated decrease since 1960 is 823,900 acre feet per year based on a linear trent

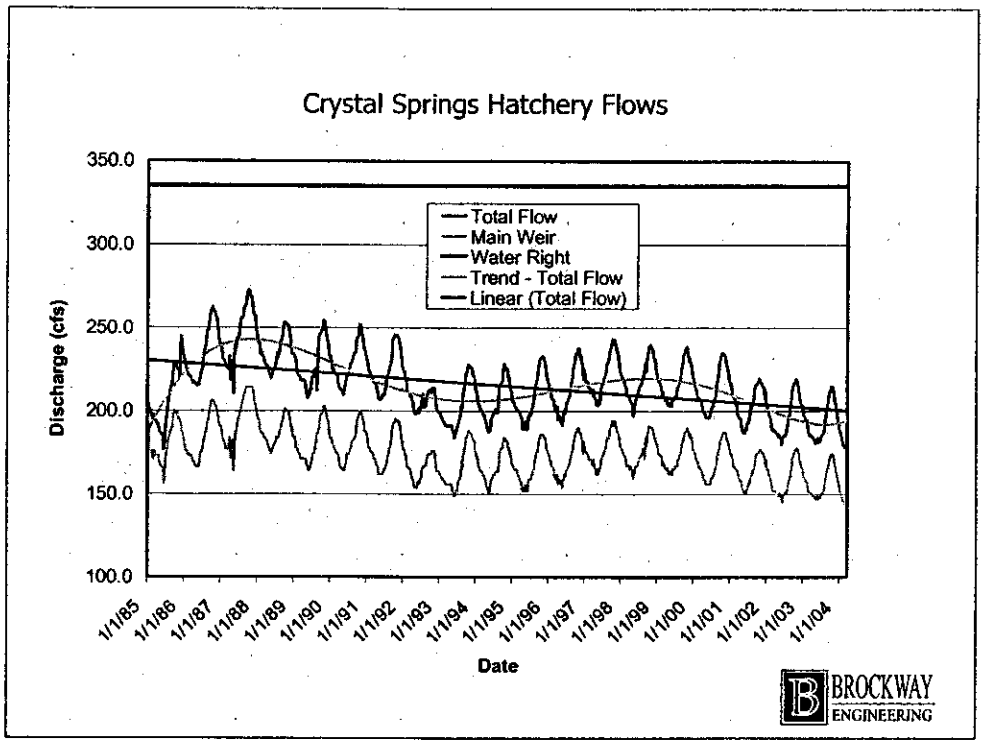
Decreasing trend is due to ground water pumping and changes in irrigation application (conversion to sprinkler)

Short term perturbations are due to fluctuations in total water supply (drought)

Major indicator springs (Box Canyon and Blue Lakes) show similar patterns of decline and similar magnitudes of decline

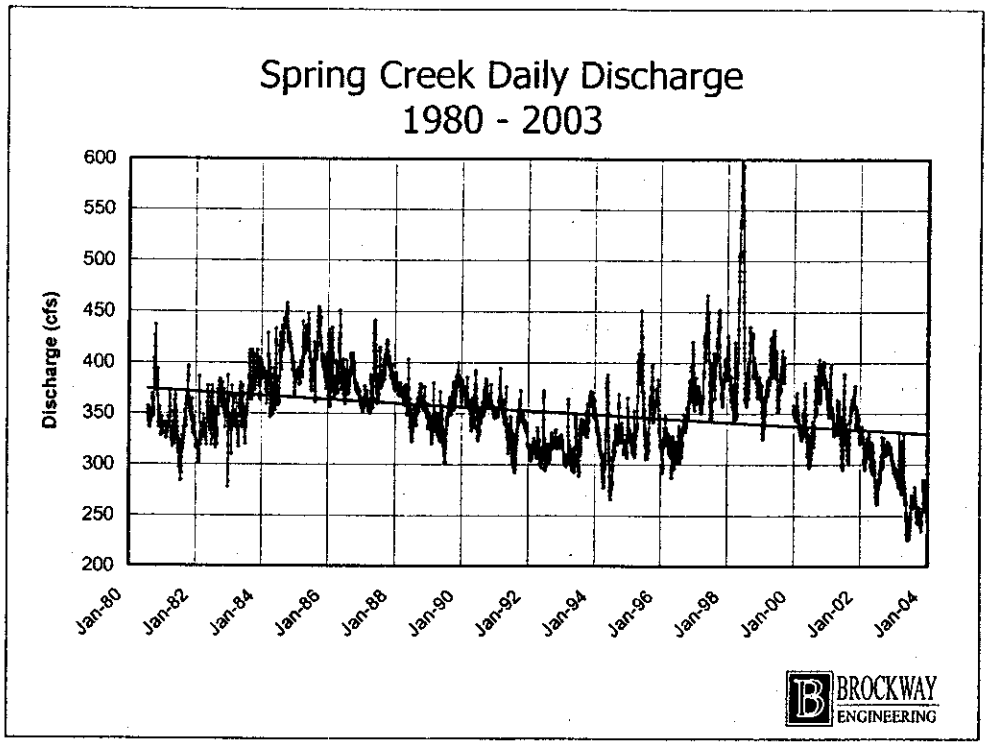
Box Canyon shows a decrease in annual volume of 72,300 acre feet per year

Blue Lakes spring show a decrease in annual volume of 56,370 acre feet per year.



Crystal Springs (Clear Springs Foods) shows a similar pattern to other major springs with similar decreases in flow.

1994 response is a result of drought impacts

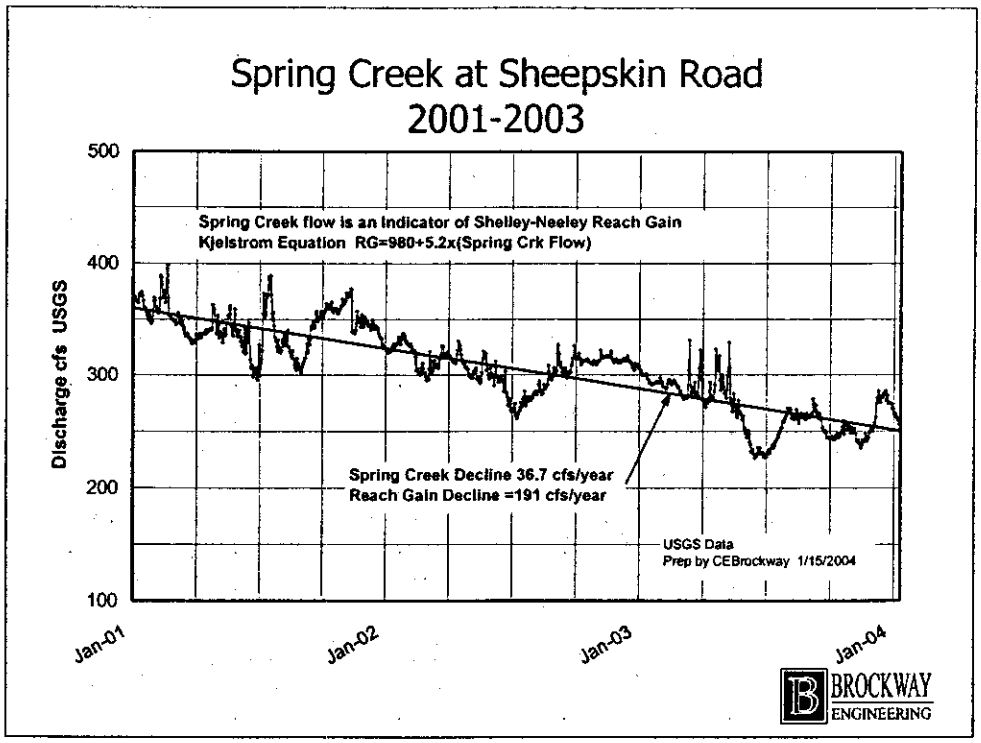


Spring Creek is the major indicator spring for outflow from the aquifer in the Shelley-Neeley (American Falls) reach. Measured since 1980

Discharge is used to estimate reach-gain in natural flow which is the source of the water right for Twin Falls Canal Company and Northside Canal Company

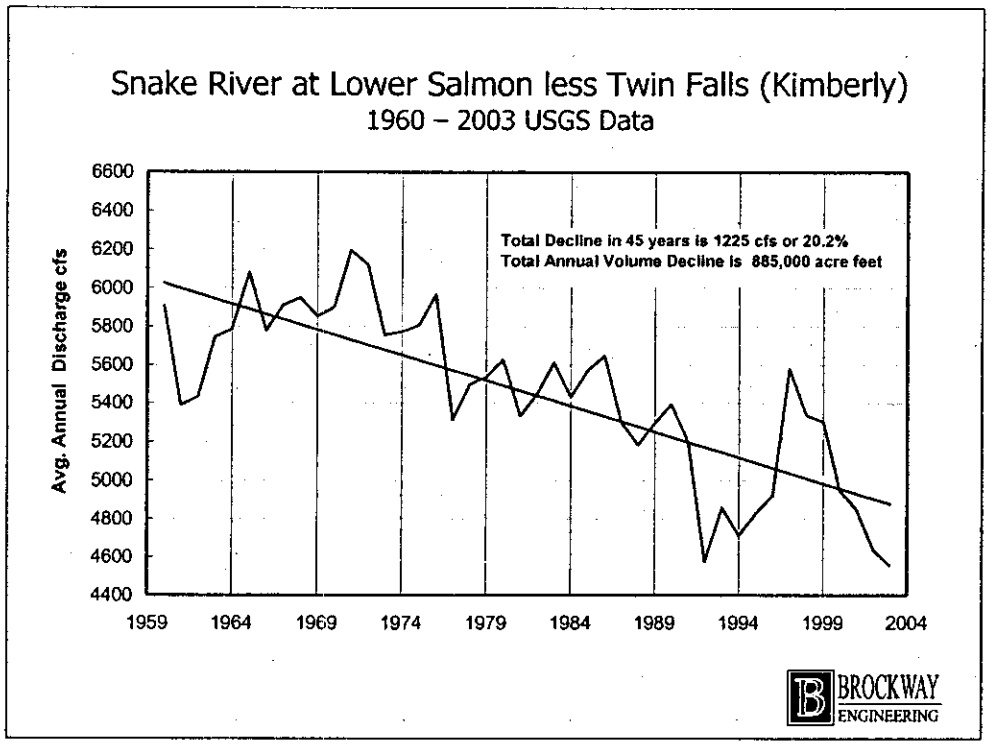
Response of this spring is similar to Thousand Springs indicator springs showing the 1994 low and wet years in late 1980's and 1997-98

Since 2001 there is an extreme decline in discharge which is drought related



During the 2001-2004 period, Spring Creek declined about 36.7 cfs per year.

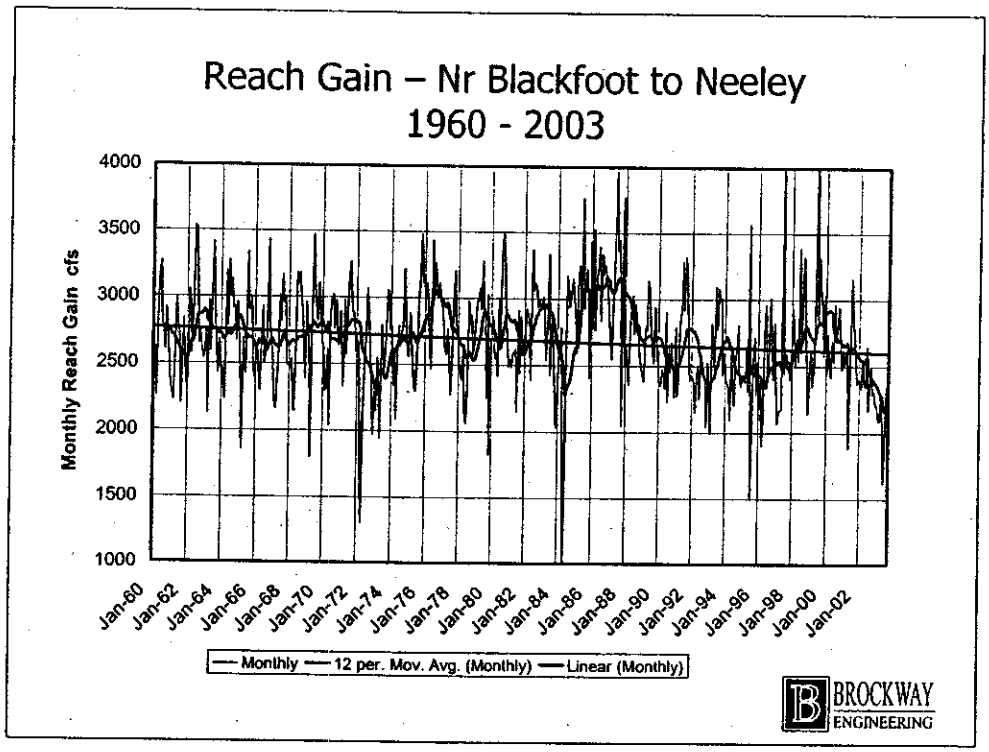
Using the Kjelstrom formula to estimate the decrease in reach gain available to lower canals this translates to 191 cfs/year or 138,000 acre feet per year decline.



Another indicator of Thousand Springs spring decline is the decrease in gain to the Snake River in the Kimberly to Lower Salmon reach.

USGS data for the period 1960 to 2003 shows a decrease of 1225 cfs in reach gain or about 885,000 acre feet. A 20.2 % decrease

This substantiates the estimate of Northside Spring decreases for the same period of about 823,900 acre feet.

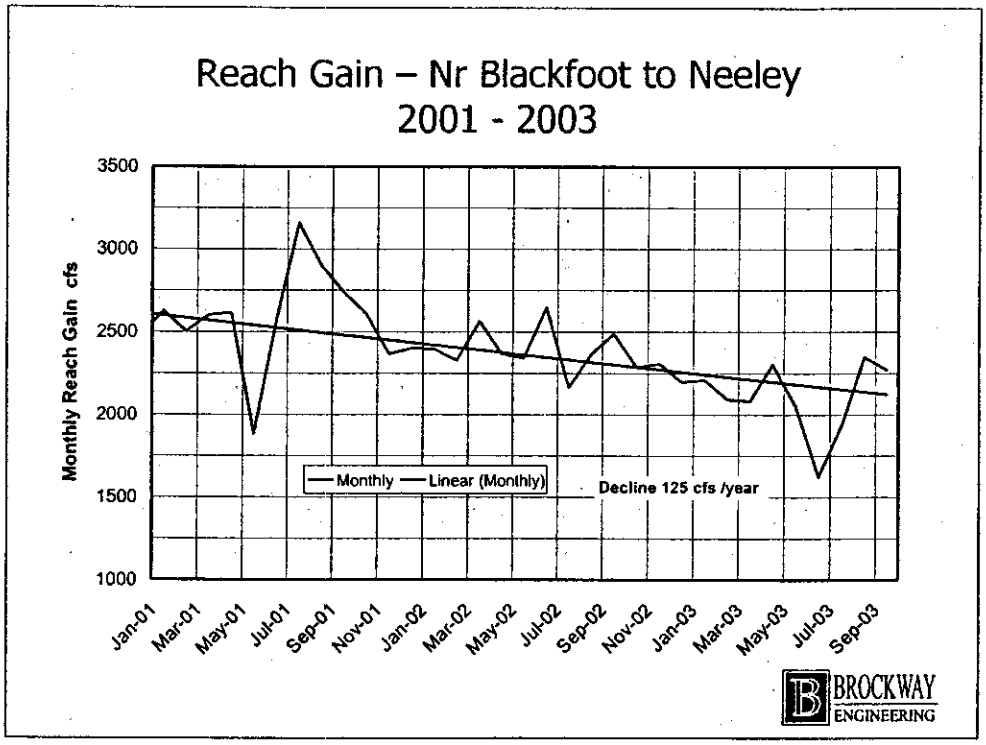


Estimated reach-gain in the nr. Blackfoot to Neeley reach of the Snake River (American Falls) for the period 1960 to 2003 shows a decline over the period but not nearly as steep as the Thousand Springs area.

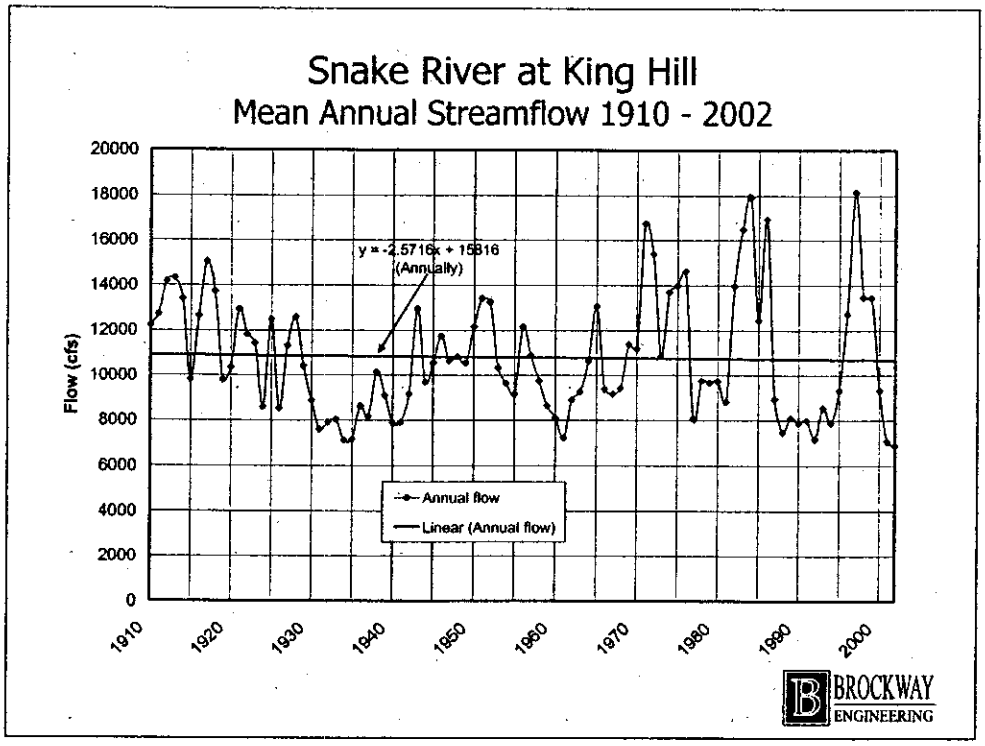
Geology of the American Falls area causes spring flows to be much more responses to changes in water levels

Indian Springs south of Blackfoot has experienced a reported decline from about 50 cfs in 2001 to 3 cfs in 2004

Response of the reach-gain shows time patterns similar to Thousand Springs and to hydrographs of wells in the area. Reach-gain in the Blackfoot-Neeley reach responds to water supply changes (drought) and to long term declines from pumping and changes in water management.



•The reach-gain in the Blackfoot-Neeley reach from 2001-2004 has declined by an estimated 125 cfs or 90,000 acre feet in less than 3 years.



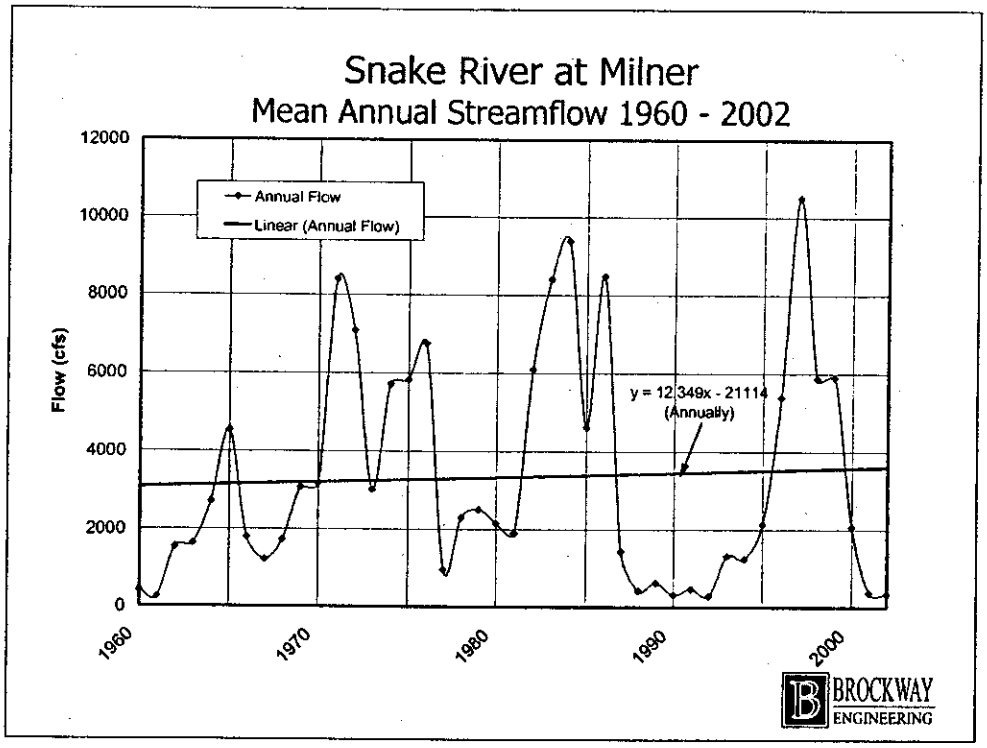
Is the total water supply in the Upper Snake Basin decreasing?

The Snake River at King Hill USGS gage is a measure of the total water leaving the basin.

If the total water supply is decreasing because of changing climate then the King Hill gage should show a significant decline in annual discharge.

The mean annual flow at King Hill from 1910 to 2002 shows significant fluctuations in annual flow and a linear trend line is nearly flat. The small negative slope to the linear trend line is not likely to be statistically significant.

Decreases in Snake River diversions of 1M acre feet per year (1384 cfs) have been reported. Where is that water?

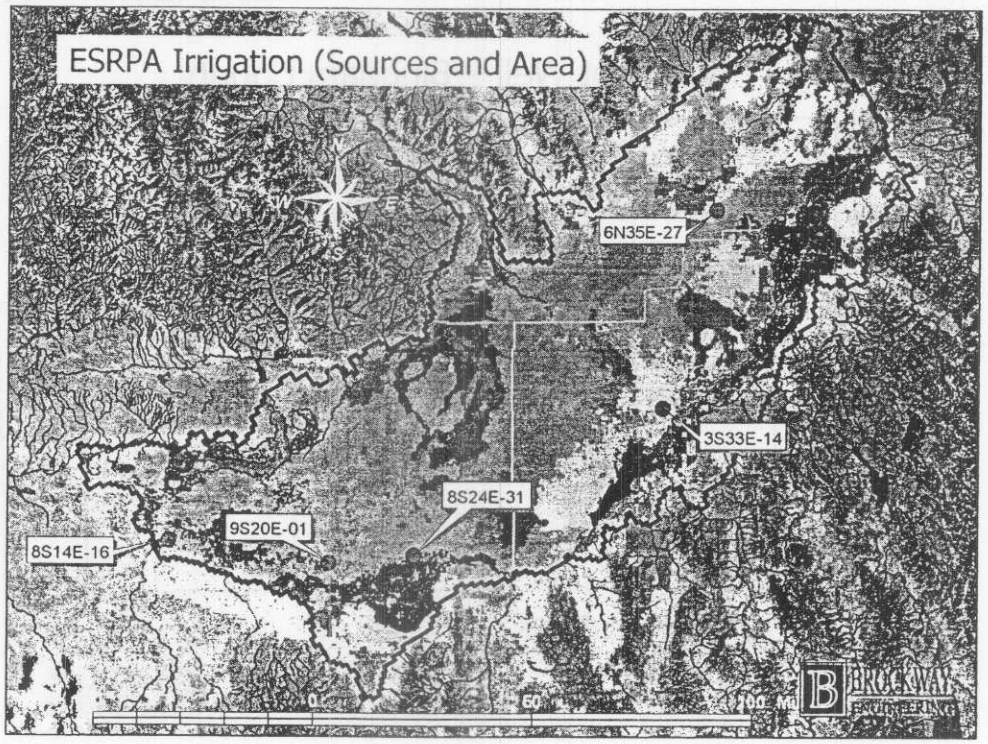


The Snake River Flow at Milner for 1960 to 2002 shows significant variability in the flow passing Milner

This flow would be available for artificial recharge through the Northside and Milner Gooding canals if it were available at the right time and at usable discharge rates.

Note that significant volumes for artificial recharge may be available above Milner in less than one-half of the years.

The linear trend line shows a small increase in annual flow


ESRPA Irrigation (Sources and Area)
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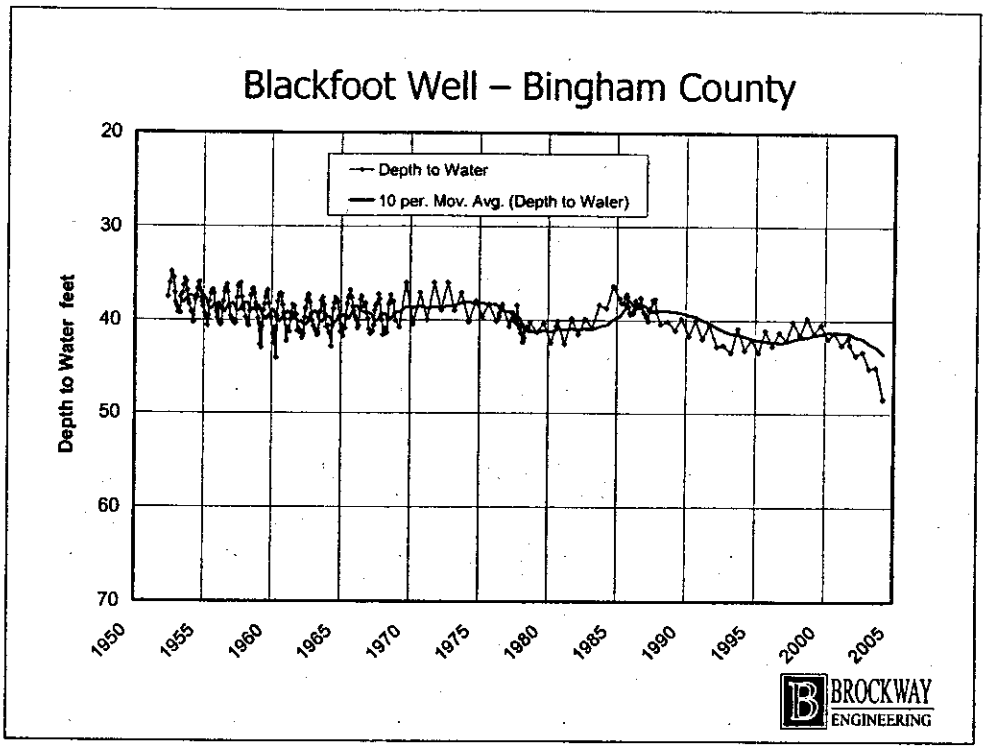
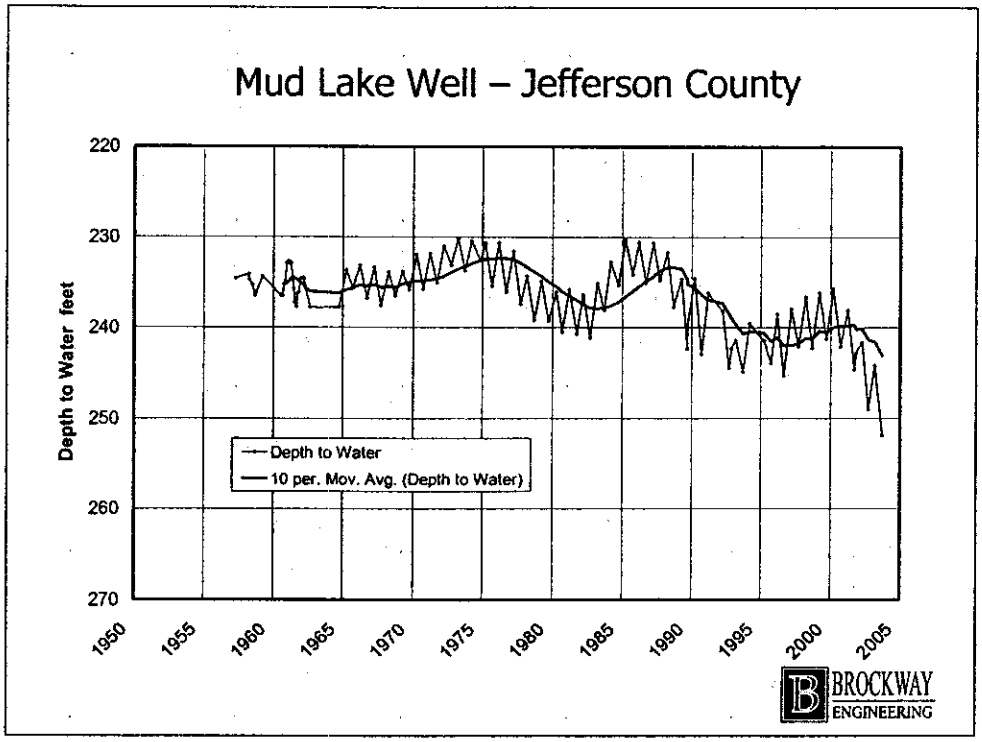
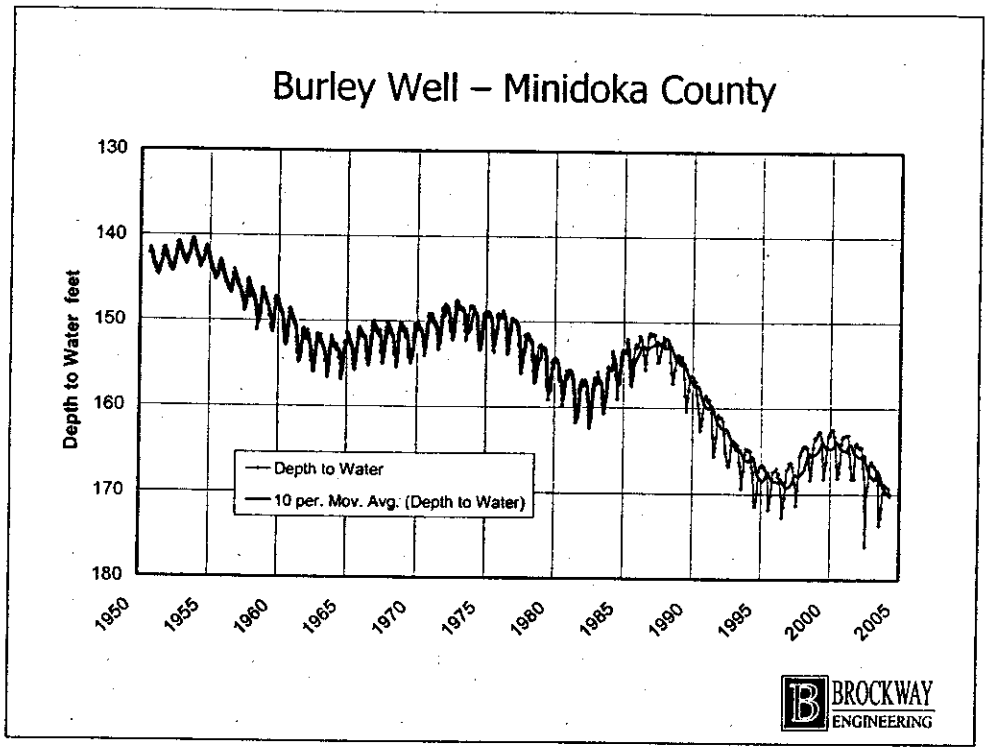


Hydrographs of typical wells in different parts of the ESRPA show similar long term responses.

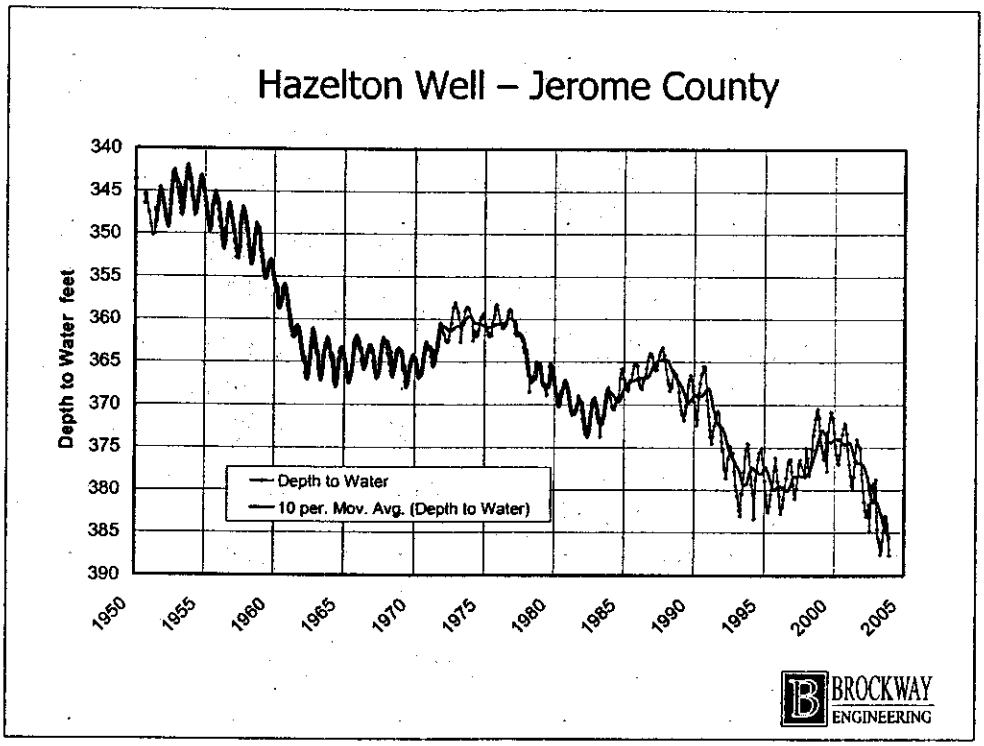
Blackfoot well in Bingham County shows significant declines in 1977, which was a very poor water year, and rebound during the late 1980's good water years. Significant declines are evident since 2001



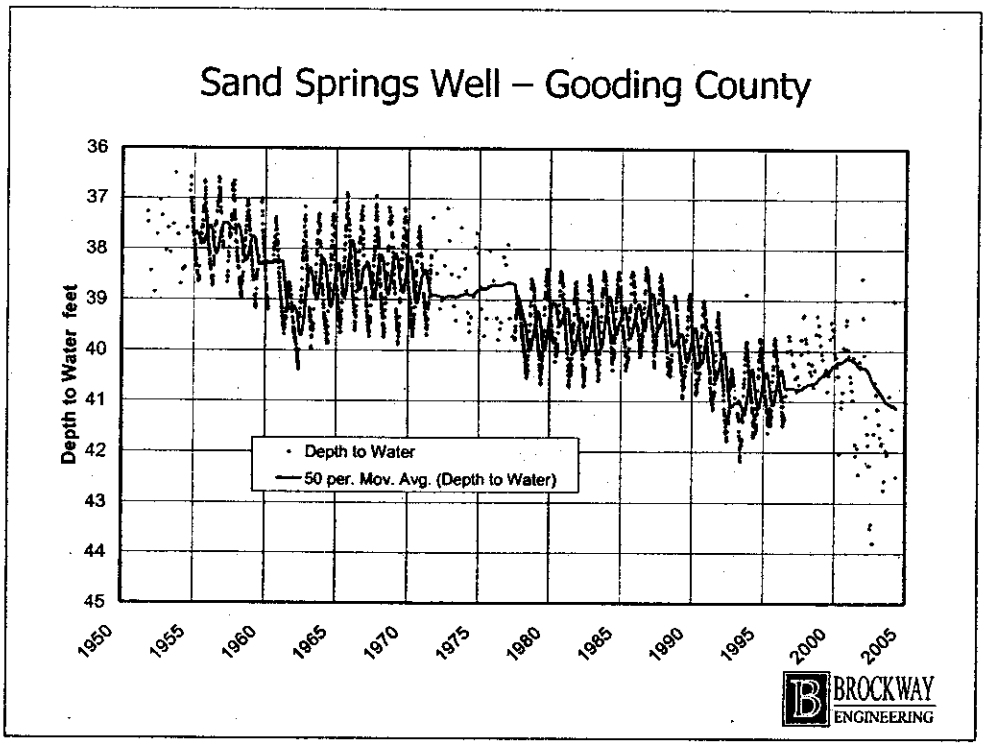
•A well in the Mudlake area also shows significant declines after 1977 and rebound in the late 1980's. After 1989 the decline is exacerbated.



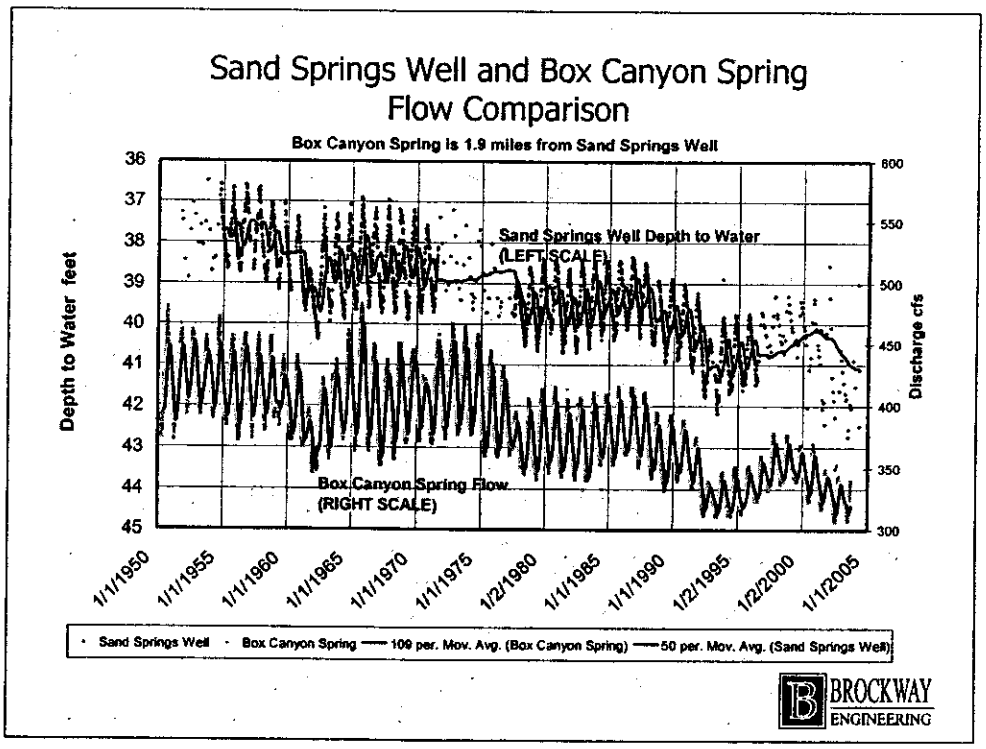
•The well north of Burley in Minidoka County shows a decline of some 30 feet over a 50 year period with similar responses to wet and dry years.



- Hazelton well-Jerome County shows a 40 foot drop over 50+years



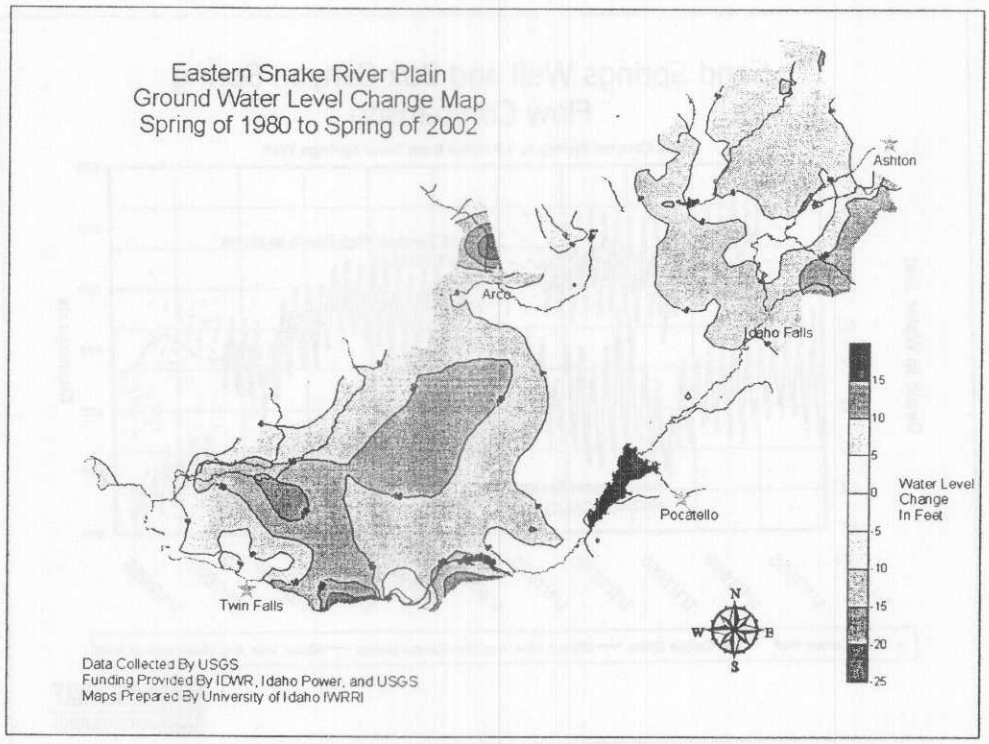
•Sands Spring well shows similar responses but a much smaller decline and amplitude. This well is near the Snake River Canyon and shows the diminution of water level responses as the aquifer thins out near the canyon rim. Decrease of 50+ year period is only four (4) feet.



A comparison of the long term response of Sand Springs well with Box Canyon spring flow shows a good visual similarity.

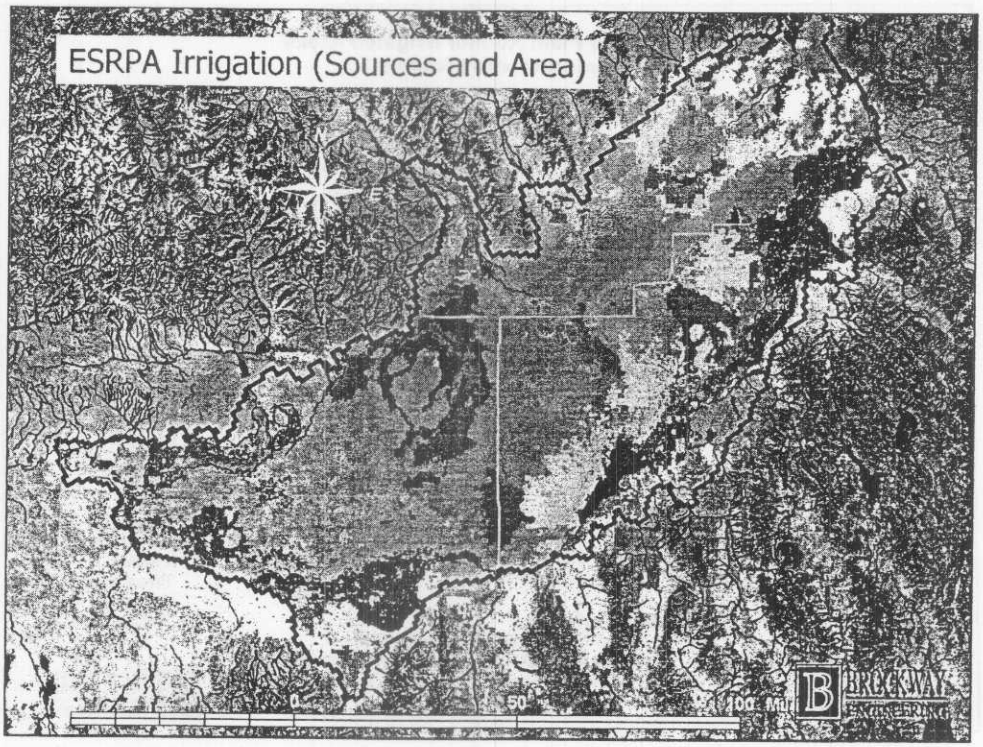
Box Canyon spring is about 1.9 miles from the Sand Springs well

Note the wide variation in depth to water after 2000 with very low water levels during some periods.



Water level change from 1980 to 2002 shows declines of as much as 25 feet in some areas but not uniformly over the aquifer. A large part of the total decline occurred during the 2000-2002 period.

On average, the change in storage in the aquifer was small between 1980 and 1999 or 2000. However, water level changes adjacent to major spring areas likely declined sufficiently to cause continued declines in spring flows.


ESRPA Irrigation (Sources and Area)
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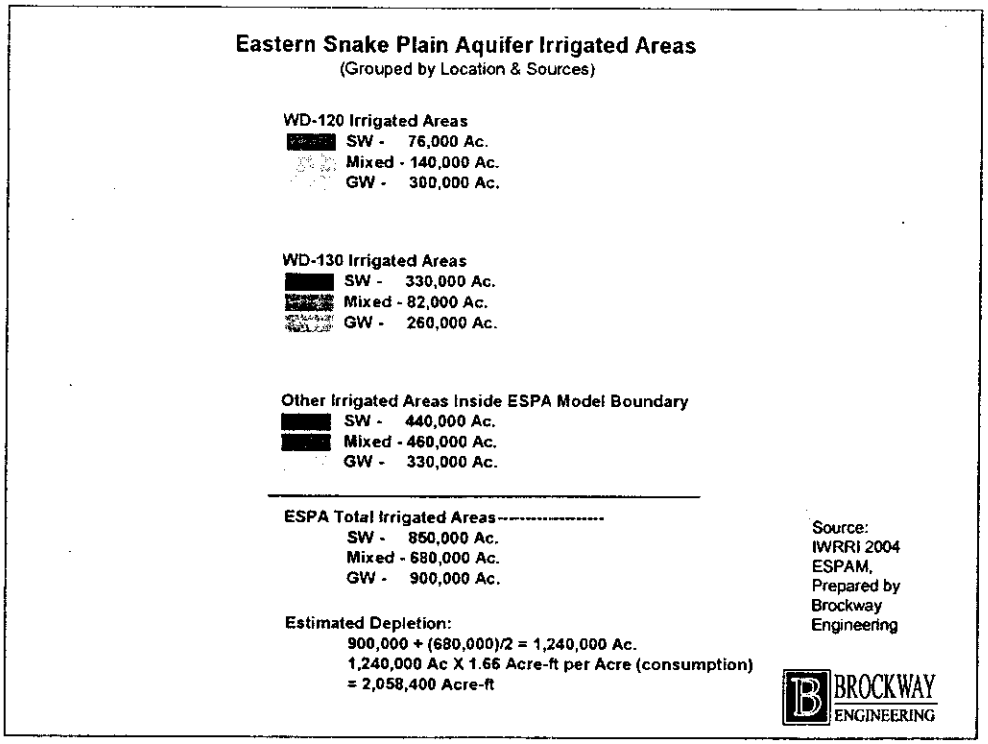


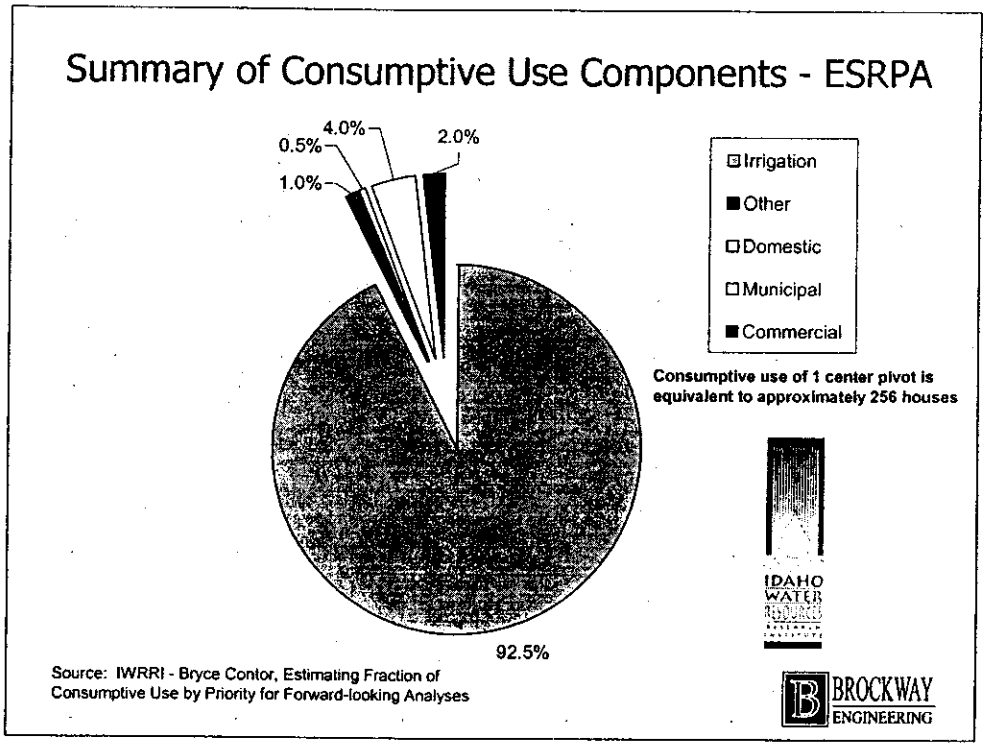
There are about 900,000 acres irrigated from ground water within the boundaries of the ESRPA

There are about 680,000 acres irrigated with mixed source (ground water and surface water)

Assuming about 50% of the mixed acres are ground water irrigated (IWRRI) then 1,240,000 acres are ground water irrigated.

Estimated average consumptive depletion is 1.66 af/a and total depletion from ground water irrigation is 2,058,000 acre feet per year.

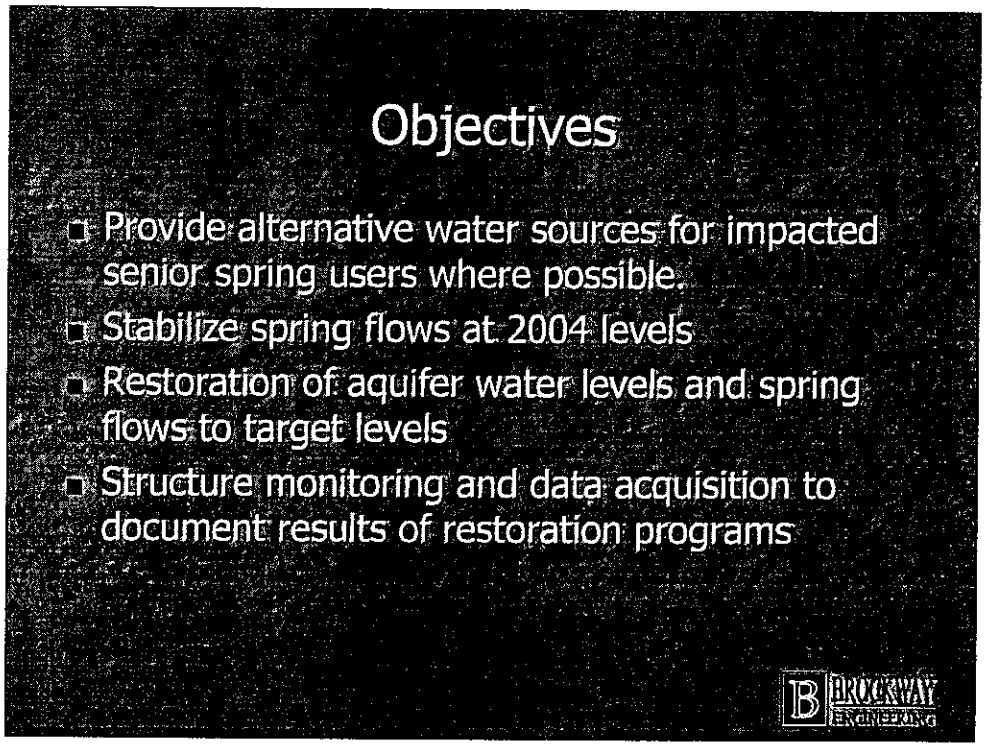
This depletion is manifested in reduced spring flow and



Pie chart shows that irrigation is the major use of ground water within the ESRPA-92,5%

Domestic use is small (0.5%)

For comparison, the consumptive use from one center pivot sprinkler is equal to the consumptive use from about 256 residences.

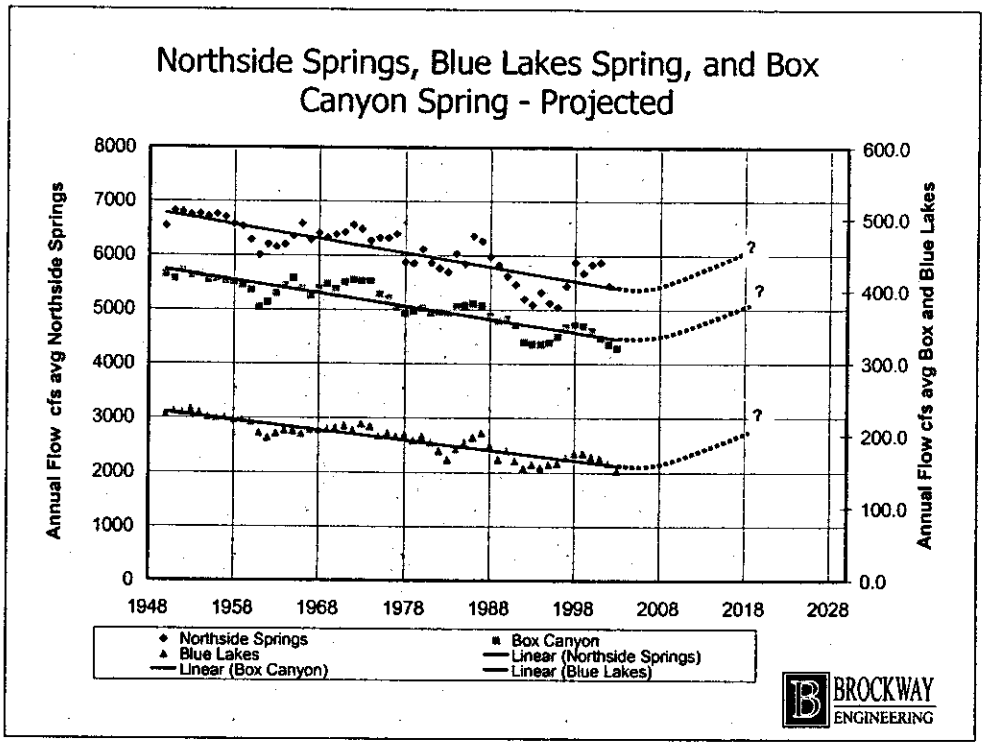


•Provide alternative water sources for impacted senior spring users where possible.

•Stabilize spring flows at 2004 levels

•Restoration of aquifer water levels and spring flows to target levels

•Structure monitoring and data acquisition to document results of restoration programs

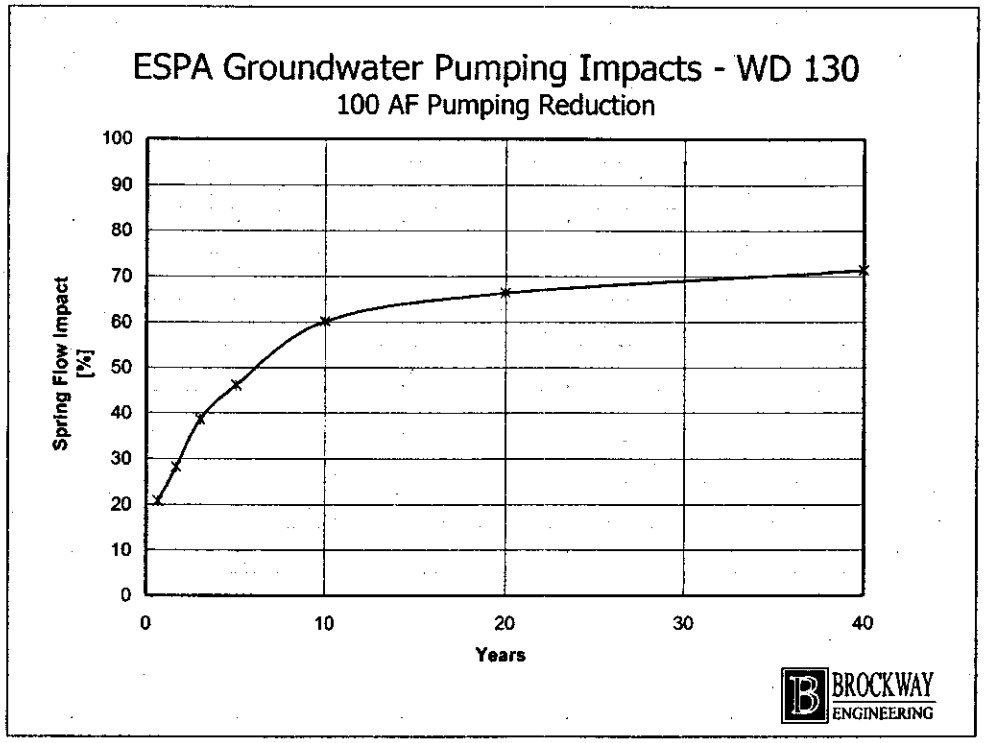


•Objective #1 should be to stem the decline of springs and reach gain at 2004 levels. Success will depend on the longevity of the drought and success of mitigation plans

•Objective #2 should be to restore springs flows and driving water levels to target levels. Target levels to be defined using the new ground water model to guide in selection of appropriate tools and levels of implementation.

•Effective methods of mitigation and restoration can be devised to provide timely, real,springflow responses

•Methods of restoration to be determined.

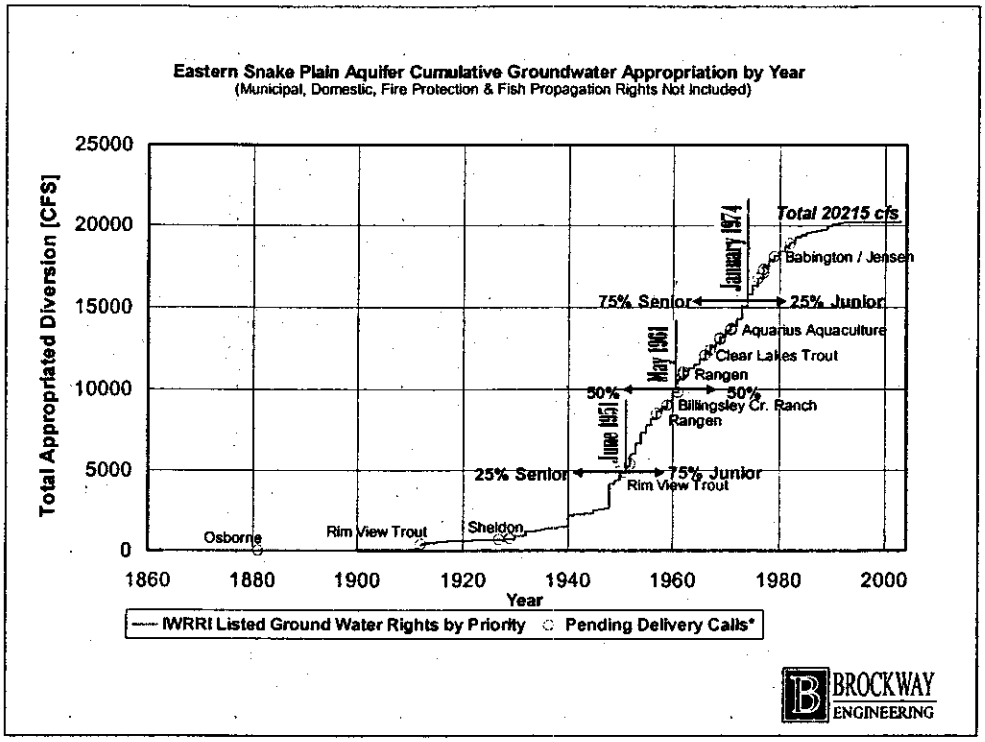


•The time effect of consumptive depletions in WD 130 on spring flows from Thousand Springs (Milner-King Hill) show that it takes about 30+ years for the near full effect of pumping to be manifested in reduced spring flows. However, 45 % occurs by the end of 5 years and 60 % by the end of 10 years.

•Similarly, reductions of depletions or recharge within WD 130 will show the same response.

•Results of mitigation programs can show real results in a reasonable time frame.

•However, the full impact of historical ground water irrigation pumping will likely require implementation of mitigation programs (recharge, conversion, curtailment) over the entire ESRP aquifer.



•There are currently 18 priority calls by senior spring water right holders

•About 50 percent of the ground water irrigation water rights are junior to May 1961 and 75 percent are junior to June 1951

•Total groundwater irrigation water rights in the ESRPA are approximately 20215 cfs

•Total estimated Thousand Springs flows are now about 5200 cfs.